Psychology of Perception

Psychology 4165, Section 100

Fall 2013, Monday, Wednesday, Friday, 11:00–11:50
Muenzinger E113

Lewis O. Harvey, Jr. – Instructor
Steven M. Parker–Assistant

Size-Distance Type of Illusion

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Syllabus Topics and Reading Assignments

26 Aug	Introduction	(Y 1)	21 Oct	Attention and Awareness	(Y 8)
28 Aug	Psychophysics •1	(Y 1)	23 Oct	Attention and Awareness	(Y 8)
30 Aug	Psychophysics	(Y 1)	25 Oct	Attention and Awareness	(Y 8)
2 Sep	No Class: Labor Day		28 Oct	Auditory System	(Y 9)
4 Sep	First Steps in Vision •2	(Y 2)	30 Oct	Auditory System	(Y 9)
6 Sep	First Steps in Vision	(Y 2)	1 Nov	Auditory System	(Y 9)
9 Sep	Visual Brain	(Y 3)	4 Nov	Auditory Brain	(Y 10)
11 Sep	Visual Brain	(Y 3)	6 Nov	Auditory Brain •6	(Y 10)
13 Sep	Visual Brain	(Y 3)	8 Nov	Auditory Brain	(Y 10)
16 Sep	Object Perception	(Y 4)	11 Nov	Music & Speech	(Y 11)
18 Sep	Object Perception •3	(Y 4)	13 Nov	Music & Speech •7	(Y 11)
20 Sep	Object Perception	(Y 4)	15 Nov	Music & Speech	(Y 11)
23 Sep	Color Vision	(Y 5)	18 Nov	Body Senses	(Y 12)
25 Sep	Color Vision •4	(Y 5)	20 Nov	Body Senses •8	(Y 12)
27 Sep	Color Vision	(Y 5)	22 Nov	Body Senses	(Y 12)
30 Sep	Depth Perception	(Y 6)	25 Nov	**Fall Break**	
2 Oct	Depth Perception •5	(Y 6)	27 Nov	**Fall Break**	
4 Oct	Depth Perception	(Y 6)	29 Nov	**Fall Break**	
7 Oct	Motion and Action	(Y 7)	2 Dec	Taste and Smell	(Y 13)
9 Oct	Motion and Action	(Y 7)	4 Dec	Taste and Smell	(Y 13)
11 Oct	Motion and Action	(Y 7)	6 Dec	Taste and Smell	(Y 13)
14 Oct	Review		9 Dec	Taste and Smell	(Y 13)
16 Oct	**First Examination**		11 Dec	Taste and Smell	(Y 13)
18 Oct	Catch our Breath		13 Dec	Wrapping Up	
			14 Dec	**Final Exam** **Saturday (16:30–19:00)**	

Textbooks for the Course

Yantis, S. (2014). *Sensation and perception*. New York, NY: Worth Publishers.

Martin, D. W. (2007). *Doing Psychology Experiments* (7th ed.). Pacific Grove, California: Brooks/Cole Publishing.

Note: The numbers in parentheses above refer to chapters in the Yantis (Y) text. Please read the indicated chapter before the class meeting.

Office Hours

Name	Lewis O. Harvey, Jr.	Steve M. Parker
Office	MUEN D251b	MUEN D352A
Hours	9:00–10:00 Tue, Wed, Thurs. and by appointment	11:00–12:30 Tuesday & Thursday and by appointment
Telephone	303-492-8882	
email	lewis.harvey@colorado.edu	Steven.Parker@colorado.edu
web	http://psych.colorado.edu/~lharvey/	

Supplemental Reading

1.	25 August 2013	(Stevens, 1961)
2.	2 September 2013	(Leibowitz & Owens, 1975)
3.	9 September 2013	(Schiller & Carvey, 2005)
4.	16 September 2013	(Kanwisher & Yovel, 2006)
5.	23 September 2013	(Jacobs & Nathans, 2009)
6.	30 September 2013	(Kaufman & Rock, 1962a, 1962b)
7.	7 October 2013	(Most & Astur, 2007)
8.	14 October 2013	**Mid-Term Exam Week**
9.	21 October 2013	(Raymond, Shapiro, & Arnell, 1992)
10.	28 October 2013	(Zwicker, Flottorp, & Stevens, 1957)
11.	4 November 2013	(Winer & Lee, 2007)
12.	11 November 2013	(MacDonald & McGurk, 1978)
13.	18 November 2013	(Ramachandran & Hirstein, 1998; Wager et al., 2013)
14.	25 November 2013	**Fall Break**
15.	2 December 2013	(Borg, Diamant, Ström, & Zotterman, 1967; Castro, Ramanathan, & Chennubhotla, 2013)
16.	9 December 2013	**Last Week of Class**

Copies of these papers are available to download for reading through D2L using your CU IdentiKey ID. See the reference section at the end of the syllabus for complete citation information.

Laboratory Schedule

Section L101: 12:30–15:20 Tuesday, Room MUEN E-311 (Steve)
Section L102: 12:30–15:20 Thursday, Room MUEN D-346 (Steve)

1.	27 & 29 August 2013	No Lab Meetings
2.	3 & 5 September 2013	Lab 1 data collection: **Noisy Representations** (Martin Chapter 1, Chapter 12)
3.	10 & 12 September 2013	Lab 1 data analyses (Martin Chapter 13)
4.	17 & 19 September 2013	Lab 2 data collection: **Signal Detection** **Lab 1 Report Due** (30 points)
5.	24 & 26 September 2013	Lab 2 data analyses
6.	1 & 3 October 2013	Lab 3 data collection: **Color Naming** **Lab 2 Report Due** (40 points)
7.	8 & 10 October 2013	Lab 3 data analysis **Form Research Project Teams** (Martin Chapters 6 & 7)
8.	15 & 17 October 2013	**Lab 3 Report Due (50 points)** Work on Group Projects **First draft of project proposal due** (Cover Page, Introduction, References)
9.	22 & 24 October 2013	Work on Group Projects **Second draft of project proposal due** (Cover Page, Introduction, Methods, Expected Results, References)
10.	29 & 31 October 2013	Work on Group Projects: Data Collection
11.	5 & 7 November 2013	Work on Group Projects: Data Collection
12.	12 & 14 November 2013	Work on Group Projects: Data Analysis
13.	19 & 21 November 2013	Work on Group Projects: Data Analysis
14.	26 & 28 November 2013	**Fall Break–No classes**
15.	3 & 5 December 2013	Work on Group Projects Work on Project Presentations
16.	10 December 2013	**All Group Project Presentations: All Groups** (20 points)
17.	11 December 2013	**Final Project Reports due in class** (40 + 20 points)

Conditions Under Which The Course Operates

Lecture:

There will be two exams given during the semester: one mid-term and one final examination. Both are required. No make-up examinations will be given. You will receive a grade of zero for each exam not taken. There will be 8 homework assignments. Each homework will be handed out on a Wednesday (marked by bullets on the syllabus) and will be due the following Wednesday.

Supplemental Reading:

There are 15 original journal papers that are assigned as part of the course. These papers will form the basis of a 10 page paper about experimental design and drawing conclusions from data that you will write. This paper will be due on Wednesday, 11 December 2013, and is worth 50 points.

Laboratory:

The laboratory is not optional in PSYC 4165. There are four assignments in the laboratory. These assignments will be graded and the sum of the four grades will be your laboratory grade. All lab assignments must be written and printed with a computer word processor and all graphs must be prepared using computer graphics.

Grading:

Your final grade is computed from your exam scores, homework grades, and the laboratory grade. The total possible points in the course is 850:

200	First Examination (16 October 2013)
300	Final Examination (14 December 2013)
200	Laboratory Grade
80	Homework Grade
50	Supplemental Reading Grade
20	Participation

850	Total Possible Points

Your final letter grade in the course will be assigned in the following manner. First a "Reference Score" will be calculated by taking the mean of the top five percent of the class. Your grade will be determined by how well you have done in comparison to this reference score:

	A >96.6%,	A- >93.3% of the reference score
B+ >90.0%,	B >86.6%,	B- >83.3% of the reference score
C+ >80.0%,	C >76.6%,	C- >73.3% of the reference score
D+ >70.0%,	D >66.6%,	D- >63.3% of the reference score
	F <63.3%	

It is therefore possible for the entire class to receive the grade of A. By the same token, it is also possible that very few people would receive an A, depending on the spread of grades across the class.

Comments About The Psychology Of Perception

Why Take This Course?

There are three reasons to take this course:

1. To gain an understanding of the capabilities and limitations of our perceptual experiences;

2. To sharpen your ability to critically evaluate the results of experiments in light of theories of perception;

3. To gain practical skills in the use of computers for designing experiments, for analyzing and graphing data, and for preparing written laboratory reports.

The study of perception is the oldest part of modern psychology. It developed from trying to answer two questions posed by philosophers: "How do we know what we know?" and "Why do things appear the way they appear?" Since most of what we know about the outside world comes to us through our sensory systems, our sensory capabilities were the first to be studied extensively. Perceptions are derived from neural and psychological mechanisms that operate on sensory information. We will study the limits of our sensory and perceptual abilities and learn how to characterize the unreliability that results from these limits.

Prerequisites:

A broad understanding of the basic concepts from a general psychology course is assumed. You will be using methods of inferential statistics, such as those taught in Psychology 3101, to evaluate the results of your experiments. A facile ability with these methods in particular and with mathematical concepts through algebra and trigonometry are required. A familiarity with calculus is helpful but is not necessary. Please work through the eight questions on the next two pages. If you find these questions very difficult and you don't even know how to find out how to answer them, you probably are not ready to take this course.

You will be expected to write in a clear and grammatically correct style in this class. If you believe you will require extra help with your writing, please visit The Writing Center located in Norlin Commons (Norlin E111). More information can be found at: http://www.colorado.edu/pwr/writingcenter.html. You can also reach The Writing Center help desk by phone at (303) 735-6906.

You need to make a considerable commitment of time to do well in this class. For each credit hour of the course you should expect to spend 3 hours on class-related activities (studying, research, writing) per week. Since the class is a four-credit course, expect to spend 12 additional hours per week outside the class and laboratory.

Skills Needed for Psychology of Perception

Question 1:
Rearrange the following linear equation to solve for *b*: $y = a + bx$

$b =$

Question 2:
Solve the following equation for *X*: $y = \log(x)$

$x =$

Question 3:
Compute the arithmetic mean and the standard deviation of this sample of numbers:
10.0, 9.0, 12.0, 11.0, 8.5, 13.0, 8.0, 10.0, 7.0, and 11.5:

$\mu =$

$\sigma =$

Question 4:
In an experiment you observe the number of times six different kinds of events occur. A theoretical model makes predictions about how often these events *should* occur. These data are presented in the table below. Compute the chi-square (χ^2) statistic to test if the observed data are significantly different from the predicted data. You may assume *n-1=5* degrees of freedom for the significance test.

	E1	E2	E3	E4	E5	E6
Observed Data	174.0	172.0	104.0	92.0	41.0	8.0
Predicted Data	175.5	167.8	106.5	90.4	44.3	6.5

$\chi^2 =$

Question 5:
In an experiment with two levels of an independent variable you observe the following values of the dependent variable for 10 subjects (five were tested under level 1 and five under level 2). Compute the mean of each column and calculate a t-test (or ANOVA if you wish) to test the hypothesis that there is a significant difference between the means:

Level 1		Level 2	
Subject	Dependent	Subject	Dependent
1	8.0	6	10.0
2	9.0	7	9.5
3	7.5	8	11.0
4	7.0	9	9.0
5	8.5	10	10.5
Mean		Mean	

$t(df) =$

$p =$

Question 6:
Convert the probability 0.8413447 to a quantile score based on the cumulative distribution function (CDF) of the unit normal Gaussian distribution (a quantile is a z-score). Such a transformation is achieved by the quantile function (`q <- qnorm(p)` in R, where p is the probability). What is the probability that a single sample drawn from a population having a Gaussian distribution with a mean of 0.0 and a standard deviation of 1.0 will have a value of 1.959964 or greater (use `pnorm(q)` in R)?

$q =$

$p =$

Question 7:
Using least-squares linear regression, compute the slope (a) and y-intercept (b) of the straight line, $y = a + bx$, that best fits this set of data. Use `lm(y ~ 1 + x)` in R:

x	1.0	3.0	5.0	7.0	9.0
y	0.98	8.73	17.0	20.9	27.4

$a =$

$b =$

Question 8:
Plot the data in Question 7 on a graph using linear axes. The x-axis should have a range of 0.0 to 10.0 and the y-axis should range from 0.0 to 30. Use the plot() function in R.

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AGREEMENTS FOR PARTICIPATING IN THE COURSE

The purpose of these agreements is to create a condition that allows all people in the class to get maximum value from the course.

AGREEMENTS

1 You agree to be responsible for these agreements.

2 You agree to be on time to class and to your laboratory meetings.

3 You agree to complete the assigned reading and homework on time.

4 You agree to complete your laboratory assignments on time.

5 You agree to attend all class and laboratory meetings unless an emergency comes up.

6 You agree to understand the material.

7 You agree to ask questions when you don't understand the material.

8 You agree to communicate any complaints and criticisms you may have only to someone who can do something about the situation and you agree not to complain or to criticize to someone who cannot do something about the situation.

9 You agree to get value out of your participation in the course.

If you attend the next class meeting, you are accepting responsibility for the above agreements.

Academic Integrity Policy

A university's intellectual reputation depends on maintaining the highest standards of intellectual honesty. Commitment to those standards is a responsibility of every student, faculty, and staff member on the University of Colorado at Boulder campus.

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Honor Code

A student-run Honor Code was instituted on the Boulder Campus in 2002. The intent of the Honor Code is to establish a community of trust where students do not plagiarize, cheat, or obtain unauthorized academic materials. An honor code council collaborates with the colleges and schools in addressing allegations and instances of academic dishonesty and in assisting to educate all members of the university community on academic integrity issues.

Breaches of academic honesty include cheating, plagiarism, and the unauthorized possession of examinations, papers, computer programs, as well as other class materials specifically released by the faculty.

A student accused of academic dishonesty will either accept the accusation made by a faculty member or request a hearing before a student panel, who will make a decision on the accusation of academic dishonesty. In addition to academic sanctions imposed by the faculty, students found guilty of academic dishonesty also face consequences from the honor code council ranging from attending a mandatory class in ethics to expulsion from the campus. More information about CU-Boulder's Honor Code may be found at www.colorado.edu/academics/honorcode/Home.html.

The following terms are clarified for the benefit of all members of the university community.

Cheating

Cheating is defined as using unauthorized materials or receiving unauthorized assistance during an examination or other academic exercise. Examples of cheating include: copying the work of another student during an examination or other academic exercise (includes computer programming), or permitting another student to copy one's work; taking an examination for another student or allowing another student to take one's examination; possessing unauthorized notes, study sheets, examinations, or other materials during an examination or other academic exercise; collaborating with another student during an academic exercise without the instructor's consent; and/or falsifying examination results.

Plagiarism

Plagiarism is defined as the use of another's ideas or words without appropriate acknowledgment. Examples of plagiarism include: failing to use quotation marks when directly quoting from a source; failing to document distinctive ideas from a source; fabricating or inventing sources; and copying information from computer-based sources, i.e., the Internet.

Unauthorized Possession or Disposition of Academic Materials

Unauthorized possession or disposition of academic materials may include: selling or purchasing examinations, papers, reports or other academic work; taking another student's academic work without permission; possessing examinations, papers, reports, or other assignments not released by an instructor; and/or submitting the same paper for multiple classes without advance instructor authorization and approval.

Reproduced from: http://www.colorado.edu/policies/academic-integrity-policy

Check out http://www.umuc.edu/writingcenter/plagiarism/ for explicit examples.

Statements Recommended by Associate Vice Chancellor for Undergraduate Education, Michael Grant

1. *Recommended syllabus statement on disabilities*:
   If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu.
   If you have a temporary medical condition or injury, see Temporary Injuries under Quick Links at Disability Services website (http://disabilityservices.colorado.edu/) and discuss your needs with your professor.

2. *Recommended syllabus statement on religious observances*:
   Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Please speak with me if you have a conflict. See policy details at
   http://www.colorado.edu/policies/fac_relig.html/

3. *Recommended syllabus statement on classroom behavior*:
   Students and faculty each have responsibility for maintaining an appropriate learning environment. Students who fail to adhere to behavioral standards may be subject to discipline. Faculty have the professional responsibility to treat students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which students express opinions. See policies at
   http://www.colorado.edu/policies/classbehavior.html/ and at
   http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code/

4. The Office of Discrimination and Harassment:
   The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. The University of Colorado does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. (Regent Law, Article 10, amended 11/8/2001). CU-Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this CU-Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, or veteran status. Individuals who believe they have been discriminated against should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://hr.colorado.edu/dh/

5. *Recommended syllabus statement on the Honor Code*: All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Additional information on the Honor Code can be found at

   http://www.colorado.edu/policies/honor.html/ and at
   http://www.colorado.edu/academics/honorcode/

References

Borg, G., Diamant, H., Ström, L., & Zotterman, Y. (1967). The relation between neural and perceptual intensity: a comparative study on the neural and psychophysical response to taste stimuli. *The Journal of Physiology, 192*(1), 13-20.

Castro, J. B., Ramanathan, A., & Chennubhotla, C. S. (2013). Categorical Dimensions of Human Odor Descriptor Space Revealed by Non-Negative Matrix Factorization. *PLoS ONE, 8*(9), e73289. doi: 10.1371/journal.pone.0073289

Jacobs, G. H., & Nathans, J. (2009). The evolution of primate color vision. *Scientific American, 300*(April), 53–63.

Kanwisher, N., & Yovel, G. (2006). The fusiform face area: a cortical region specialized for the perception of faces. *Philosophical Transactions of the Royal Society B: Biological Sciences, 361*(1476), 2109-2128. doi: 10.1098/rstb.2006.1934

Kaufman, E. L., & Rock, I. (1962a). The Moon Illusion: I. *Science, 136*(3519), 953-961.

Kaufman, E. L., & Rock, I. (1962b). The Moon Illusion: II. *Science, 136*(3521), 1023-1031.

Leibowitz, H. W., & Owens, D. A. (1975). Night myopia and the intermediate dark focus of accommodation. *Journal of the Optical Society of America, 65*(10), 1121–1128.

MacDonald, J., & McGurk, H. (1978). Visual influences on speech perception processes. *Perception & Psychophysics, 24*(3), 253257.

Most, S. B., & Astur, R. S. (2007). Feature-based attentional set as a cause of traffic accidents. *Visual Cognition, 15*(2), 125-132.

Ramachandran, V. S., & Hirstein, W. (1998). The perception of phantom limbs. The D. O. Hebb lecture. *Brain, 121*(9), 1603-1630. doi: 10.1093/brain/121.9.1603

Raymond, J. E., Shapiro, K. L., & Arnell, K. M. (1992). Temporary suppression of visual porocessing in an RSVP task: An attentional blink? *Journal of Experimental Psychology: Human Perception & Performance, 18*(3), 849–860.

Schiller, P. H., & Carvey, C. E. (2005). The Hermann grid illusion revisited. *Perception, 34*(11), 1375-1397.

Stevens, S. S. (1961). To Honor Fechner and Repeal His Law. *Science, 133*(3446), 80-86. doi: 10.1126/science.133.3446.80

Wager, T. D., Atlas, L. Y., Lindquist, M. A., Roy, M., Woo, C.-W., & Kross, E. (2013). An fMRI-Based Neurologic Signature of Physical Pain. *New England Journal of Medicine, 368*(15), 1388-1397. doi: 10.1056/NEJMoa1204471

Winer, J. A., & Lee, C. C. (2007). The distributed auditory cortex. *Hearing Research, 229*(1-2), 3-13. doi: 10.1016/j.heares.2007.01.017

Zwicker, E., Flottorp, G., & Stevens, S. S. (1957). Critical band width in loudness summation. *Journal of the Acoustical Society of America, 29*(5), 548-557.